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FOUR NEW ECHINODERMS FROM THE WEST INDIES.

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Despite the fact that the West Indian region has been the scene of more intensive study than any other portion of the tropical seas, hitherto unknown animal types are continually being discovered there. Since the inception of the investigation of the Caribbean abysses a dozen able and energetic zoölogists have contributed to the increase and systematization of our knowledge of the echinoderm fauna, and yet new, and often remarkable, types still turn up with surprising frequency.

Of the four echinoderms described in the following pages the two crinoids and the starfish were collected by the "Albatross;" the ophiuran was collected by Mr. John B. Henderson during the course of his memorable cruise on the "Tomas Barrera."

I. CRINOIDS.

Neocomatella ornata new species.

The centrodorsal is discoidal, with a broad flat finely pitted polar area 4 mm. in diameter.

The cirri are XIX, 19-21, about 20 mm. long; the first segment is very short, the second somewhat longer, the third about as long as broad, the fourth and fifth the longest, about twice as long as broad, the fifth slightly longer than the fourth; the fifth is a transition segment, proximally dull like the preceding, but highly polished in its distal fourth; the sixth is about as long as the fourth, and the following gradually decrease in length, becoming about as long as broad on the eighth or ninth, and beyond slightly broader than long; the transition and following segments have the distal dorsal edge prominent; after the seventh the dorsal side rises evenly from the base to the tip so that the segments are trapezoidal in shape, and in lateral view the cirrus has a serrate appearance; after the eleventh the proximal half of the dorsal side becomes rather less produced, but the distal half rather more so, so that in lateral view there

appears to be a low broadly rounded dorsal spine on each segment which arises from somewhat more than the distal half of the dorsal surface of the segments. In the more compressed distal segments the produced distal dorsal edge, at first crescentic in end view, becomes narrower, but does not lose in height, so that it changes to rounded triangular and, as less of the dorsal surface is involved, appears tubercular; a faint median carination is traceable on the distal half of the later segments; the opposing spine is very low, median in position, involving the entire surface of the penultimate segment; the terminal claw is slightly longer than the penultimate segment, rather slender, and moderately curved.

The ends of the basal rays are just visible in the angles of the calyx; the radials are only slightly visible in the angles of the calyx over the ends of the basal rays; the I Br₁ are exceedingly short and band-like, in lateral apposition for rather more than their basal half but separated by a U-shaped gap anteriorly; the I Br₂ are broadly pentagonal, the lateral edges about as long as those of the I Br₁, approximately twice as broad as long; the II Br are 2; the I Br axillary and the elements of the II Br series are rounded dorsally and laterally, and entirely free laterally; the synarthrial tubercles are broad and low, though rather noticeable.

There are nineteen arms in the type, about 120 mm. long; the first two brachials are equal and similar in shape, slightly wedge-shaped, the longer side out, about twice as broad as the exterior length; the first brachial, like the II Br₁, is interiorly united for nearly its entire length; the second, like the II Br₂, is usually interiorly in apposition with its neighbor, though not united to it; the first syzygial pair (formed of the third and fourth brachials) is about as long as broad; the fifth and sixth brachials are oblong, about twice as broad as long, the following brachials become very oblique, and after the eighth or ninth triangular, about as long as broad, later becoming wedge-shaped, and somewhat less oblique distally; the terminal portion of the arms is not preserved. The ossicles of the I Br and II Br series and the first two brachials have the dorsal surface thickly covered with small shallow pits; the distal edge of the second brachial is everted and somewhat prominent, tending to form a rounded distal dorsal prominence which is thickly beset with small spines; this condition rapidly increases distally, the brachials after the eighth having strongly produced distal ends which are armed with a frill of rather coarse spines, these produced distal ends standing out nearly perpendicularly to the axis of the arm; with the gradual narrowing of the arm distally this eversion of the distal ends of the brachials gradually narrows, but does not decrease in height, so that on the later brachials it appears as a laterally oblong distal tubercle with the summit thickly studded with small spines standing vertically outward and reaching rather more than half the lateral diameter of the brachials in height. In lateral view these tubercles appear as rounded distal spines, the general effect being the same as in the more carinate varieties of *Tropiometra picta*.

Syzygies occur between the first and second brachials, again always between the third and fourth; the next syzygy is almost always between

the seventeenth and eighteenth (but varying from between the thirteenth and fourteenth to between the eighteenth and nineteenth); the distal intersyzygial interval appears to be from six to eight oblique muscular articulations. The syzygies are exceedingly difficult to detect as the perisome covering the dorsal surface of the segments is somewhat swollen and opaque, thus masking the structure underneath.

P_1 is about 15 mm. long, much stouter basally than the succeeding but tapering with moderate rapidity and slender and flagellate in its distal two-thirds, composed of about forty segments, at first about twice as broad as long, more or less rhombic with the corners cut away, becoming about as long as broad and squarish after the tenth; the terminal comb is long, rising gradually, with twenty-five teeth, which at first are low, after the fifth becoming blunt-triangular, higher than broad basally (about as high as the lateral diameter of the segment bearing them), with the apex leaning somewhat distally; in the outer part of the pinnule the shape changes somewhat, the last nine being much more rounded distally, erect, and slightly shorter; the teeth are slightly recurved; P_2 is 8 mm. long, much more slender than P_1 basally and with fewer segments, but otherwise similar to it, and with a similar comb; the following pinnules gradually decrease in length to P_6 , which is 6 mm. long with a rather small comb; P_6 is rather stouter than P_5 , which resembles the preceding, and P_7 and the following pinnules are stouter still, though slender in the distal half; this stoutness persists in the following pinnules, though in the distal pinnules it is less in extent, occupying only about one-third of their length; the genital pinnules are about 6 mm. or 7 mm. long, stout basally but evenly tapering and becoming slender in the distal half, with sixteen segments of which the first three are twice as broad as long, the fourth is somewhat smaller and proportionately slightly longer, the fifth or sixth is squarish, those after the ninth longer than broad, and the distal more than twice as long as broad; the distal pinnules are 10 mm. long, the proximal segments much broader than long, large, the following becoming gradually narrower and proportionately shorter, squarish after the fifth or sixth, and slender and rather more than twice as long as broad distally. The surface of the pinnule segments is rough, and the ends are always more or less spinous; the distal dorsal surface of the segments is usually studded with small spines, but is never produced nor carinate.

The color in alcohol is white.

Type.—Cat. No. 34,482 U. S. N. M., from "Albatross" Station 2321, off Havana, Cuba, in 230 fathoms.

Nemaster insolitus new species.

The centrodorsal is discoidal, broad, rather thin, the flat polar area from 3 mm. to 4 mm. in diameter, sometimes with a slight shallow median pit; the cirrus sockets are closely crowded, arranged in one and a more or less complete second alternating rows.

The cirri are xv-xxi, 10-12, 10 mm. to 12 mm. long; the first segment

is very short, the second squarish or slightly longer than broad, the third from half again to nearly twice as long as its proximal diameter, the fourth the longest, twice as long as its proximal diameter or somewhat longer; the fifth is as long as the third, and the following gradually decrease in length to the antepenultimate, which is about as long as broad; the penultimate segment is somewhat longer ventrally than dorsally, one-third to one-half again as broad as its ventral length; the opposing spine is small, erect, arising from the whole dorsal surface of the penultimate segment, the apex slightly beyond the center of the latter; the terminal claw is long and slender, about three-quarters of the length of the penultimate and antepenultimate segments together, moderately curved; the second and following segments as far as the terminal three or four are very strongly constricted centrally as viewed dorsally, with much expanded articulations; but this character is only slightly marked in lateral view, being due to the lateral expansion of the articulations over the ends of the articulating ridges as a center; most of the segments are smooth dorsally, but the antepenultimate always, the preceding often, and the one preceding that sometimes, has a small subterminal tubercle or small spine which, though often but slightly marked, is always present; its position on the antepenultimate segment is but little in advance of the center, on the preceding more distal, and on the third from the last it is situated near the distal border.

The ends of the basal rays are visible as small tubercles in the angles of the calyx; the radials are concealed in the median line, showing slightly in the angles of the calyx; the $I Br_1$ are oblong, with the proximal border often convex, about two and one-half times as broad as the median length, rounded laterally and entirely separated, even at the base; the $I Br_2$ (axillaries) are almost triangular, between one and one-half times and twice as broad as long, the anterior angle sharp, though not produced, the lateral sides short, forming an obtuse angle with those of the $I Br_1$, or parallel in the proximal half but diverging in the distal; $II Br 4$ (3+4); division series comparatively slender and widely separated; first ossicles following each axillary united interiorly for about the proximal two-thirds, those following the $I Br$ axillary then diverging at an acute angle, those after the $II Br$ axillary remaining in apposition in the distal third, though not united.

Sixteen to twenty very slender arms about 150 mm. long; the first brachial is wedge-shaped, about twice as broad as the exterior length; the second is similar in shape and size; on arms springing from a $II Br$ axillary the first brachial is much larger, being not greatly broader than the exterior length; first syzygial pair (on arms arising from the $II Br$ axillaries composed of the second and third brachials, on those arising from the $I Br$ axillaries of the third and fourth) oblong, about half again as broad as long, or slightly broader; following three brachials (following one or two on arms springing from a $II Br$ axillary) oblong, about twice as broad as long, then becoming very obliquely wedge-shaped, about as long as broad, in the distal part of the arm less obliquely wedge-shaped, almost oblong, about as long as broad, and in the attenuated

terminal portion longer than broad; after the first two or three the brachials develop overlapping and finely spinous distal edges which become prominent after the sixth or eighth, though their development is never very great; they are plainly evident even in the attenuated terminal portion of the arm. Syzygies occur between the third and fourth brachials (the second and third in arms arising from a II Br axillary), again between the sixth and seventh to ninth and tenth, and subsequently at intervals of four oblique muscular articulations.

The mouth and anal tube are about equidistant from the center of the disk; the mouth is radial; the disk is entirely covered with a pavement of very small plates, with a few larger ones which rise above the general surface scattered about the interpalmar areas; in the lateral interbrachial regions of the disk the mass of small plates tends to divide into two columns of large plates based upon a single plate in the interradian angle.

P_D is 12 mm. long, stout basally but tapering rather rapidly and slender and flagellate in the distal two-thirds, with nearly forty segments of which the first is about twice as broad as long, the second is nearly as long as broad, the third is of about the same proportions, and the following gradually increase in length, becoming about as long as broad after the seventh and slightly longer than broad in the terminal portion; the segments in the proximal third have very prominently everted and spinous distal ends; the comb consists of thirteen teeth, the terminal two or three more or less obsolete; the teeth are slightly longer than broad basally, about as long as the lateral diameter of the segment which bears them, rounded, well separated, and beset with small marginal spines; except for the first two or three all the teeth are double, the segments bearing another similar, but smaller, tooth on the opposite side; P_1 7 mm. long, much more slender than P_D though similar to it, and with a similar comb; P_3 is small, slender and weak, 3 mm. long with about fifteen segments, bearing a more or less imperfect comb distally; P_4 and the following pinnules resemble P_3 , but are without combs; on arms arising directly from a I Br axillary P_1 resembles P_D as described, P_2 resembles P_1 , etc.; the distal pinnules are 9 mm. long, very slender, with about twenty segments of which the first is short, the second half again as long as broad, the following rapidly becoming elongate, and about three times as long as broad; the segments all have very strongly overlapping and spinous distal ends, as do the segments of all the pinnules except in the distal portion of the first one or two.

Color in alcohol white, yellowish white, or violet, the cirri and pinnules dark purple with the ends of the segments white, in sharp contrast.

Type.—Cat. No. 25,458 U. S. N. M., from "Albatross" Station 2146, Caribbean Sea, in 34 fathoms.

II. STARFISH.

Plinthaster productus new species.

Five arms; $R=27$ mm.; $r=12$ mm.; $R:r=2.25:1$; superomarginals 10 or 11, of which the distal 8 are united interiorly to form the ray.

General form pentagonal, with slightly incurved sides, the angles of the

pentagon produced into rather long slender arms, which are as long as the distance from their bases to the center of the disk.

The abactinal surface is covered with more or less regular hexagonal plates which are largest in the central portion, within a circle the periphery of which is indicated by the madreporite. From the apical plate a regular row of nine plates, all approximately equal in size and smaller than the plates in the center of the abactinal region, runs to the arm bases, where it terminates against two or three large, irregular, wedge-shaped plates. In the outer two-thirds of the abactinal area this radial row is bordered with a similar row on either side. In the interradial triangles the plates decrease regularly in size from the center to the margin, remaining hexagonal as far as the row adjoining the superomarginals, in which the plates are very irregular in shape and in size. The plates of the abactinal surface are naked, except for a peripheral row of flattened granules, which on the four or five central plates in the radial rows is supplemented by a second similar row of higher granules just within it; the most proximal of these plates bearing the second row of granules usually has it developed only along the distal margin, while the plates of the two rows adjoining the median row have the second row developed on the adradial side. A few plates, especially in the central region, have from one to three widely scattered granules on their surface.

The madreporite is prominent, rounded triangular, with a very convex and irregular surface.

The superomarginals are similar and of equal size as far as the arm bases, thence decreasing rather rapidly to the arm tips. They are somewhat tumid, especially those of the arms, and are naked except for a bordering series of closely packed flattened granules, which disappears on the outer half of the arm. Those in the interbrachial arc may bear scattered granules on the surface, and may have in addition one or two extra rows along the lower border and extending for a short distance along the sides.

The inferomarginals are everywhere much lower than the superomarginals, though reaching the same vertical plane; in the interbrachial arc they correspond to the superomarginals, but on the arms they do not decrease so rapidly in length, and so come to overlap the bases of the next succeeding superomarginals.

On the actinal surface the decrease in size of the inferomarginals at the arm bases is much more abrupt than in the case of the superomarginals, and along the arms the former are much narrower, being twice as long as broad, whereas the superomarginals are always broader than long.

The inferomarginals are bordered with a row of flattened granules like the superomarginals, while those of the interbrachial arc have an additional row actinally extending part way up the sides, and just beneath the upper margin numerous closely packed granules which extend downward along the sides.

The actinal intermediate plates do not extend beyond the third inferomarginal; that is, they are entirely confined to the triangle between the adambulacra and the inferomarginals of the interbrachial arc. They

are arranged in three rows parallel to the adambulacrals, with two or three additional next to the median inferomarginals. The innermost row (next to the adambulacrals) consists of about nine (corresponding to fourteen adambulacrals), the next of four or five, and the third of three, within which are two or three against the central inferomarginals. The actinal intermediate plates are covered with rather large spaced granules, consisting of a border series and from nine to fifteen central, according to the size of the plate.

The adambulacral plates are twice as broad as long, with a straight furrow margin. They carry four or five untapered furrow spines which are in length about equal to half the width of the plate, and are subequal, very regular, arranged in a straight row. Beyond these is a naked space, followed by a row of two or three rather stout, more or less conical, spines, usually more or less diagonal in position with the distal nearest the furrow series. Beyond these again are from four to six well spaced granular spines in two rows, resembling the granules on the actinal intermediate plates, but slightly larger and more spaced; on the distal adambulacrals these become more numerous, smaller, and less spaced.

The mouth plates are triangular, very inconspicuous; the furrow margin is longer than the edge adjacent to the first adambulacral. The armature consists of three well spaced stout spines, followed by four much more slender crowded spines, similar to those of the furrow series on the adambulacrals; within these are three or four stout well spaced spines continuing the second series on the adambulacrals; within these again are five or six spaced granules, continuous with the granules on the adjacent actinal intermediate plates.

The color in alcohol is white.

Type.—Cat. No. 36,930 U. S. N. M., from "Albatross" Station 2154, off Havana, Cuba, in 310 fathoms.

III. BRITTLE STAR.

Ophiocnida cubana new species.

Disk 4.3 mm. in diameter, slightly convex as in *O. filogranea*, covered with prominent, slightly tumid, imbricating scales, among which the circular primary plates, which are of nearly equal size and are separated by spaces equal to their diameter or somewhat greater (up to about a diameter and a half), stand out rather prominently.

In general the arrangement of the scales on the disk, and the form, size, proportions, and amount and character of the partial separation of the radial shields, agree with the same features in *O. filogranea*.

Scattered evenly over the surface of the disk there are approximately seventy-five smooth cylindrical spines which in length are equal to about two-thirds of the diameter of the circular primary plates.

Along the periphery of the disk, beginning in a line between the outer angles of the subtriangular radial shields, are very numerous and thickly set spines, somewhat shorter than the spines on the dorsal surface, which

are continued over the edges of the disk, on the lower side in each inter-brachial arc covering a triangular restricted area, just as do the very much shorter and much more numerous and thickly set spines in *O. filogranea*.

The broad spineless areas bordering the genital slits are covered with large and prominent imbricated scales as in *O. filogranea*.

The arms are approximately 33 mm. long; the upper arm plates are about twice as broad as long, more or less fan-shaped, with broadly rounded outer angles. The under arm plates resemble those of *O. filogranea*, but are proportionately slightly longer.

The three arm spines are rather stout basally, but taper rapidly to a point; they are similar and equal in length, being roughly as long as, or slightly longer than, the lateral diameter of the lower arm plates.

On the basal portion of the arms there are two tentacle scales of which the inner is much larger than the outer; further out on the arm the smaller gradually decreases in size and finally disappears. On some arms the smaller may be more or less completely absent even from the arm bases.

The arrangement of the plates about the mouth does not differ from that found in *O. filogranea*, except that the plates are somewhat more swollen, the oral shields are more regularly rhombic, and the distal mouth papillæ are proportionately smaller, being not greatly larger than the proximal, and inwardly more separated.

The structure of the jaws resembles closely that in some specimens of *O. lovéni* at hand from Rio de Janeiro; but the mouth papillæ are more rounded and less pointed, and the distal are more separated interiorly.

Type.—Cat. No. 34,763, U. S. N. M., from Ensenada de Santa Rosa, western Cuba, in 1-3 fathoms.